IN THE TITLE:

Please amend the Title of the Application to as follows:

"Spatial Separation and Multi-Polarization of Antennae in a Wireless ~~Cellular~~ Network"

IN THE DRAWINGS

Please amend Figures 1 and 9 in accordance with the marked-up drawing sheets attached hereto.

IN THE SPECIFICATION

Please amend the specification as follows:

• Please amend the paragraph beginning at line 16 on page 19 as follows:

Figure 6a is a plot of the singular values (averaged across small scale fades) versus time for the system of Figure 4 that includes spatially separate antennae having the same polarization states and a K-factor of 6 dB. The system of Figure 4 includes two transmitter antennae and three receiver antennae. Therefore the channel matrix H has two singular values. The first singular value 605 has an average value of about 7.5 dB relative to a normalized reference. The second singular value 610 has an average value of about -12.5 dB. Therefore, the resulting singular value spread is about 7.5 + 12.5 = 20 dB.

• Please amend the paragraph beginning at line 3 of page 20 as follows:

Figure 6b is a plot of the singular values versus time for the system of Figure 5 that includes spatially separate antennae having the different polarization states and a K-factor of 6 dB. Again, the channel matrix H has two singular

values. The first singular value <u>615</u> has an average value of about 5 dB. The second singular value <u>620</u> has an average value of about -5 dB. Therefore, the resulting singular value spread is about 5 + 5 = 10 dB. The system of Figure 5 provides a singular value spread that is 10 dB less than the singular value spread of the system of Figure 4, and therefore, has a better noise enhancement performance.

- Please amend the paragraph beginning with line 11 of page 20 as follows:

Figure 6c is a plot that shows the capacity of the systems of Figure 4 and Figure 5 with a K-factor of 6 dB. As shown in Figure 6c, the capacity of the system of Figure 5 <u>(denoted with line 635)</u> is greater than the capacity of the system of Figure 4 <u>(line 630)</u>. The probability axis indicates the probability that a receiver can receive information at the specified capacity or less. The capacity axis indicates the capacity of the channel for the specified antenna polarization settings.

- Please amend the paragraph beginning with line 17 of page 20 as follows:

Figure 7a is a plot of the singular values versus time for the system of Figure 4 that includes spatially separate antennae having the same polarization states and a K-factor of 10 dB. Again, the channel matrix H has two singular values. The first singular value <u>705</u> has an average value of about 7.5 dB relative to a normalized reference. The second singular value <u>710</u> has an average value of about -15 dB. Therefore, the resulting singular value spread is about 7.5 + 12.5 = 22.5 dB.

- Please amend the paragraph beginning at line 1 of page 21 as follows

Figure 7b is a plot of the singular values versus time for the system of Figure 5 that includes spatially separate antennae having the different polarization states and a K-factor of 10 dB. Again, the channel matrix H has two singular values. The first singular value 715 has an average value of about 4 dB. The second singular value 720 has an average value of about -4 dB. Therefore, the resulting singular value spread is about 5 + 5 = 8 dB. The system of Figure 5 provides a singular value spread that is 14.5 dB less than the singular value spread of the system of Figure 4.

• Please amend the paragraph beginning with line 8 of page 21 as follows:

Figure 7c is a plot that shows the capacity of the systems of Figure 4 and Figure 5 with a K-factor of ~~6~~ 10 dB. As shown in Figure 7c, the capacity of the system of Figure 5 (denoted with line 735) is greater than the capacity of the system of Figure 4 (line 730). The probability axis indicates the probability that a receiver can receive information at the specified capacity or less. The capacity axis indicates the capacity of the channel for the specified antenna polarization settings.

PENDING CLAIMS:

The currently pending claims, as originally filed, are provided as follows:

1. (Currently Amended) A wireless communication system comprising:

a plurality of spatially separate transceiver antennae to transmit a corresponding plurality of data streams comprising a communication channel to a remote receiver having a plurality of receiver antennae, ~~each transceiver spatially separate from at least one other transceiver antenna,~~ each transceiver antenna ~~further~~ comprising a transceiver

antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, ~~each transceiver antenna transmitting a corresponding data stream;~~

~~a plurality of receiver antennae, the receiver antennae receiving at least one data stream;~~ wherein

the communication channel between the transceiver antennae and the receiver antennae is characterized by a channel matrix, and wherein the transceiver antenna polarization of each transceiver antenna is ~~pre-set to optimize~~ determined by reducing a measure of a singular value spread of the channel matrix to improve a separability of ~~the~~ received data streams.

2. (Currently Amended) The wireless communication system of claim 1, wherein the ~~pre-set~~ transceiver antenna polarization of each transceiver antenna is determined experimentally.

3. (Currently Amended) The wireless communication system of claim 2, wherein the ~~pre-set~~ transceiver antenna polarization of each transceiver antenna is experimentally determined by characterizing the separability of received data streams.

4. ***Please cancel claim 4, without prejudice.***

5. (Original) The wireless communication system of claim 1, wherein each receiver antenna is spatially separate from at least one other receiver antenna, each receiver

antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna.

6. (Currently Amended) The wireless communication system of claim 1, further comprising a receiver that is connected to the receiver antenna, the receiver including electronic circuitry for estimating ~~a~~ the channel matrix that represents ~~a~~ the transmission channel between the transceiver antennae and the receiver antennae, the ~~pre-set~~ transceiver antenna polarization of each transceiver antenna being determined by ~~minimizing a~~ reducing the measure of the singular value spread of the channel matrix.

7. (Currently Amended) The wireless communication system of claim 5, wherein the receiver antenna polarization of each receiver antenna is ~~pre-set~~ set to optimize separability of the received data streams.

8. (Currently Amended) The wireless communication system of claim 7, wherein the ~~pre-set~~ receiver antenna polarization of each receiver antenna is determined experimentally.

9. ***Please cancel claim 9, without prejudice.***

10. (Original) The wireless communication system of claim 1, wherein the transceiver antenna polarization of each transceiver antenna is pre-set to minimize correlation between the data streams.

11. (Original) The wireless communication system of claim 10, wherein the pre-set transceiver antenna polarization of each transceiver antenna is determined experimentally.

12. (Original) The wireless communication system of claim 11, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set transceiver antenna polarization of each transceiver antenna is experimentally determined by minimizing a correlation coefficient of the channel matrix.

13. (Original) The wireless communication system of claim 5, wherein the receiver antenna polarization of each receiver antenna is pre-set to minimize correlation between the data streams.

14. (Original) The wireless communication system of claim 13, wherein the pre-set receiver antenna polarization of each receiver antenna is determined experimentally.

15. (Original) The wireless communication system of claim 14, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the pre-set receiver antenna polarization of each receiver antenna is experimentally determined by minimizing a correlation coefficient of the channel matrix.

16. (Original) The wireless communication system of claim 1, further comprising clusters of transceiver antennae, each cluster including a transmission channel, wherein the pre-set transceiver antenna polarization of each transceiver antenna is experimentally determined by minimizing co-channel interference between the clusters.

17. (Currently Amended) A wireless communication system comprising:

a plurality of spatially separate transceiver antennae to transmit a corresponding plurality of data streams comprising a communication channel to a remote receiver having a plurality of receiver antennae,~~ each transceiver spatially separate from at least one other transceiver antenna,~~ each transceiver antenna ~~further~~ comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, ~~each transceiver antenna transmitting a corresponding data stream;~~

~~a plurality of receiver antennae, the receiver antennae receiving at least one data stream;~~ wherein

the communication channel between the transceiver antennae and the receiver antennae is characterized by a channel matrix, and wherein the transceiver antenna polarization of each transceiver antenna is adaptively set to ~~optimize~~ reduce a measure of singular value spread of the channel matrix ~~separability of the received data streams base on channel parameters determined within a receiver connected to the receiver antennae~~.

18. (Currently Amended) The wireless communication system of claim 17, wherein the receiver includes electronic circuitry for estimating ~~a~~ the channel matrix that represent a transmission channel between the transceiver antennae and the receiver antennae, the transceiver antenna polarization of each transceiver antenna being adaptively set by minimizing ~~a~~ the singular value spread of the channel matrix.

19. (Original) A method of wirelessly communicating between a transceiver and a receiver within a wireless communication system, the communication system comprising the transceiver, the transceiver comprising a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, the communication system further comprising the receiver, the receiver comprising a plurality of receiver antennae, the method comprising:

each transceiver antenna transmitting a corresponding data stream;

the receiver antennae receiving at least one data stream;

electronic circuitry within the receiver estimating a channel matrix that represents a transmission channel between the transceiver antennae and the receiver antennae; and

pre-setting the transceiver antenna polarization of each transceiver antenna by minimizing a singular value spread of the channel matrix.

20. (Original) The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 19, wherein each receiver

antenna is spatially separate from at least one other receiver antenna, each receiver antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna, the method further comprising:

pre-setting the receiver antenna polarization of each receiver antenna by minimizing a singular value spread of the channel matrix.

21. (Original) The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 19, the method comprising:

pre-setting the transceiver antenna polarization of each transceiver antenna to minimize correlation between the data streams.

22. (Original) The method of wirelessly communicating between a transceiver and a receiver within a wireless communication system of claim 20, the method comprising:

pre-setting the receiver antenna polarization of each receiver antenna to minimize correlation between the data streams.

23. (CurrentlyAmended) A wireless communication system ~~comprising:~~

~~a plurality of transceiver antennae, each transceiver spatially separate from at least one other transceiver antenna, each transceiver antenna further comprising a transceiver antenna polarization, at least one transceiver antenna having a polarization that is different than at least one other transceiver antenna, each transceiver antenna transmitting a corresponding data stream;~~

~~a plurality of~~ a receiver, including one or more receiver antennae, the receiver antennae receiving at least one data stream from a remote transmitter having a plurality of transceiver antennae, at least one transceiver antenna having a polarization that is different from at least one other transceiver antenna, each transceiver antenna corresponding an associated data stream; and

means for setting the transceiver antenna polarization of each transceiver antenna to reduce a measure of singular value spread of a channel matrix representation of a transmission channel including at least a subset of the data streams between the transceiver antennae and the one or more receiver antennae ~~optimize separability of the received data streams~~.

24. ***Please cancel claim 24 without prejudice.***

25. (Original) The wireless communication system of claim 23, wherein each receiver antenna is spatially separate from at least one other receiver antenna, each receiver antenna further comprising a receiver antenna polarization, at least one receiver antenna having a polarization that is different than at least one other receiver antenna.

26. (Currently Amended) The wireless communication system of claim 23, ~~further comprising a receiver that is connected to the receiver antennae~~, the receiver including electronic circuitry ~~for estimating a~~ to estimate the channel matrix that represents ~~a~~ the transmission channel between the transceiver antennae and the receiver antennae, wherein the means for setting the transceiver antenna polarization of each transceiver

antenna is responsive to the electronic circuitry ~~minimizing a singular value spread of the channel matrix~~.

27. (Original) The wireless communication system of claim 25, further comprising means for setting the receiver antenna polarization of each receiver antenna to optimize separability of the received data streams.

28. (Original) The wireless communication system of claim 27, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the means for setting the receiver antenna polarization of each receiver antenna comprises minimizing a singular value spread of the channel matrix.

29. (Original) The wireless communication system of claim 25, further comprising means for setting the receiver antenna polarization of each receiver antenna to optimize de-correlation of the received data streams.

30. (Original) The wireless communication system of claim 29, wherein a transmission channel between the transceiver antennae and the receiver antennae is estimated with a channel matrix, and wherein the means for setting the receiver antenna polarization of each receiver antenna comprises minimizing a correlation coefficient of the channel matrix.

31. ***Please cancel claim 31 without prejudice.***

32. (New) A wireless communication system of claim 23, wherein the means for setting the transceiver antennae polarization resides within the receiver.

33. (New) A method comprising:

receiving a plurality of signals from a remote transmitter, the remote transmitter transmitting the plurality of signals from two or more transceiver antennae, wherein at least one transceiver antenna has a different polarization than another transceiver antenna;

developing a channel matrix representation of a transmission channel that includes at least a subset of the plurality of received signals; and

determining an improved polarization for at least a subset of the transceiver antennae to reduce a singular value spread in the developed channel matrix.